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Specification

[Title of the Invention]

TOUCH PANEL APPARATUS

[Scope of the Claims]

[Claim 1]

A touch panel apparatus comprising: liquid crystal display means including a liquid crystal section, an illuminating section disposed at a rear side of said liquid crystal section for illuminating said liquid crystal section, and a frame section disposed on an outer periphery of said liquid crystal section; a transparent resistive membrane type of touch panel disposed at a front side of said liquid crystal display means; and a spacer member disposed between said frame section of said liquid crystal display means and a periphery of said touch panel for defining a clearance between said liquid crystal section of said liquid crystal display means and said touch panel;

wherein said spacer member covers an area from a front surface of said frame section of said liquid crystal display means to a periphery of a front surface of said liquid crystal section while maintaining said clearance between said liquid crystal section and said liquid crystal display means.

[Claim 2]

The touch panel apparatus according to Claim 1, wherein a portion of said spacer member that covers said liquid crystal section is provided in a rear surface with a recess for defining a clearance between said spacer member and said liquid crystal section.

[Claim 3]

The touch panel apparatus according to Claim 1 or 2, wherein a portion of said spacer member that covers said liquid crystal section is provided in a front surface with a recess for defining a clearance between said spacer member and said touch panel.

[Claim 4]

The touch panel apparatus according to any one of Claims 1 to 3, wherein said spacer member is formed to expose only a display area on a front surface of said liquid crystal section and to cover a periphery of said front surface.

[Claim 5]

The touch panel apparatus according to any one of Claims 1 to 4, wherein a lower positioning wall projects from a rear surface of said spacer member to engage an outer peripheral side surface of said frame section of said liquid crystal display means, thereby positioning said frame section with respect to the rear surface of said spacer member.

[Claim 6]

The touch panel apparatus according to any one of Claims 1 to 5, wherein an upper positioning wall projects from said front surface of said spacer member to engage an outer peripheral side surface of said touch panel, thereby positioning said touch panel with respect to the front surface of said spacer member.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention]

This invention relates to a resistive membrane type of touch panel apparatus to be used for a display device or the like mounted in an automobile vehicle.

[0002]

[Prior Art]

Figure 1 is a general perspective view of a conventional touch panel apparatus. Figure 4 is a cross section view taken along line IV-IV in Figure 1.

[0003]

For example, a conventional touch panel apparatus 100, as shown in Figures 1 and 4, has been known (Patent Document 1). The touch panel apparatus 100 comprises: a liquid crystal display device 3 including a liquid crystal section 13, an illuminating section 15 disposed at a rear side of the liquid crystal section 13 for illuminating it, and a frame section 17 disposed on an outer periphery of the liquid crystal section 13; a transparent resistive membrane type of touch panel 5 disposed at a front side of the liquid crystal display device 3; and a spacer member 107 disposed between the frame section 17 of the liquid crystal display device 3 and a periphery of the touch panel 5 for defining a clearance between the liquid crystal section 13 of the liquid crystal display device 3 and the touch panel 5. An element 9 in Figures 1 and 4 is a cover for containing the touch panel 5 and liquid crystal display device 3.

[0004]

In the conventional touch panel apparatus 100, since the spacer member 107 defines the clearance between the liquid crystal section 13 and the touch panel 5, the spacer member 107 suppresses the touch panel 5 from being rearwardly flexured to contact with the liquid crystal section 13 upon touch operation onto the touch panel 5.

[0005]

[Patent Document 1]

Japanese Published Patent Application 2000-222162

[0006]

[Problems to be Resolved by the Invention]

The conventional touch panel apparatus 100 suppresses a failure in display in the liquid crystal section 13. The spacer member 107 is spaced away from the liquid crystal section 13, so the spacer member 107 does not contact, for example, a periphery of the liquid crystal section 13.

[0007]

Consequently, lights S from the illuminating section 15 leak from an outer periphery of the liquid crystal section 13 (for example, a clearance between the liquid crystal section 13 and the frame section 17) to a front side of the liquid crystal section 13. This will deteriorate a display design of the liquid crystal section 13 at nighttime.

[0008]

Accordingly, an object of the present invention is to provide a touch panel apparatus that can suppress a liquid crystal section from causing a failure in display on account of contact between a spacer member and the liquid crystal section and can suppress lights from an illuminating section from leaking through an outer periphery of the liquid crystal section (for example, a clearance between a liquid crystal section of liquid crystal display means and a frame section) to a front side of the liquid crystal section.

[0009]

[Means of Solving the Problem]

In order to solve the above problems, the invention of Claim 1 is directed to a touch panel apparatus comprising: liquid crystal display means including a liquid crystal section, an illuminating section disposed at a rear side of the liquid crystal section for illuminating the liquid crystal section, and a frame section disposed on an outer periphery of the liquid crystal section; a transparent resistive membrane type of touch panel disposed at a front side of the liquid crystal

display means; and a spacer member disposed between the frame section of the liquid crystal display means and a periphery of the touch panel for defining a clearance between the liquid crystal section of the liquid crystal display means and the touch panel. The spacer member covers an area from a front surface of the frame section of the liquid crystal display means to a periphery of a front surface of the liquid crystal section while maintaining the clearance between the liquid crystal section and the liquid crystal display means.

[0010]

In the invention of Claim 2, a portion of the spacer member that covers the liquid crystal section is provided in a rear surface with a recess for defining a clearance between the spacer member and the liquid crystal section.

[0011]

In the invention of Claim 3, a portion of the spacer member that covers the liquid crystal section is provided in a front surface with a recess for defining a clearance between the spacer member and the touch panel.

[0012]

In the invention of Claim 4, the spacer member is formed to expose only a display area on a front surface of the liquid crystal section and to cover a periphery of the front surface.

[0013]

In the invention of Claim 5, a lower positioning wall projects from a rear surface of the spacer member to engage an outer peripheral side surface of the frame section of the liquid crystal display means, thereby positioning the frame section with respect to the rear surface of the spacer member.

[0014]

In the invention of Claim 6, an upper positioning wall projects from the front surface of the spacer member to engage an outer peripheral side surface of the touch panel, thereby positioning the touch panel with respect to the front surface of the spacer member.

[0015]

[Embodiments]

Figure 1 is a general perspective view of embodiments of a touch panel apparatus in accordance with the present invention. Figure 2 is a cross section taken along line II-II in Figure 1. Figure 3 is an enlarged cross section of a part of an element 7 shown in Figure 2.

[0016]

A touch panel apparatus 1 in this embodiment, as shown in Figures 1 and 2, comprises: a liquid crystal display device (liquid crystal display means) 3 on which an image for a touch operation is displayed; a transparent resistive membrane type of touch panel 5 disposed at a front side of the liquid crystal display device 3 for detecting an touch operation to an image for a touch operation displayed on the liquid crystal display device 3; a spacer member 7 disposed between the liquid crystal display device 3 and the touch panel 5; and a containing cover 9 for accommodating the respective elements 3, 5, and 7 so that an action area 5a on the touch panel 5 is exposed from a central front window 9b in the cover 9.

[0017]

The liquid crystal display device 3 includes a liquid crystal section 13 for generating an image for a touch operation, an illuminating section 15 disposed at a rear side of the liquid crystal section 13 for illuminating the image for the touch operation generated on the liquid crystal section 13, and a frame section 17 disposed on an outer periphery of the liquid crystal section 13. The frame section 17 is provided as a containing case for accommodating the liquid

crystal section 13 and the illustrating section 15 so that the frame section 17 exposes a front surface 13u of the liquid crystal section 13 through an opening 17a formed in a central part of the front surface 17u of the frame section 17 (In this embodiment, for example, the front surface 13u of the liquid crystal section 13 projects forward through the opening 17a in the frame section 17 from the front surface 17u of the frame section 17.).

[0018]

The touch panel 5 includes a front conductive transparent sheet member 5u and a rear conductive transparent sheet member 5d. The sheet members 5u and 5d are opposite to each other and spaced away from each other at a given distance. The front (rear) conductive sheet member 5u (5d) includes an undepicted transparent sheet member and an undepicted transparent electrode formed on a rear (front) surface of the transparent sheet member in, for example, a so-called matrix type or analogue type forming pattern. In this embodiment, the action area 5a on the touch panel 5 is set to be, for example, within a display area 13a of the liquid crystal section 13 of the liquid crystal device 3.

[0019]

In the above construction, when a touch operation is performed on the touch panel 5 at the front side, a touch pressure at the touch position brings the respective conductive transparent sheet members 5u and 5d into a local short circuit. The short circuit position (that is, touch position) on the touch panel 5 is detected by an undepicted detecting section in accordance with a detecting principle corresponding to the type (matrix type or analogue type) of the forming pattern of the transparent electrodes of the conductive transparent sheet members 5u, 5d. Thus, the touch operation onto the touch panel 5 (that is, touch operation onto an image for a touch operation displayed on the liquid crystal device 3) can be detected.

[0020]

The spacer member 7 is made of, for example, a resin material or an elastic material. The spacer member 7 covers a periphery 13b of the front surface 13u of the liquid crystal section 13 from the front surface 17u of the frame section 17 of the liquid crystal display device 3, so the spacer member 7 is spaced away from the liquid crystal section 13 and does not extend within the display area 13a on the front surface 13u of the liquid crystal section 13 and the action area 5a on the touch panel 5.

[0021]

In more detail, the spacer member 7, as shown in Figure 2, includes a plate-like spacer body 71 having a frame-like configuration in a plan view. The spacer body 71 covers an area from the front surface 17u of the frame section 17 of the liquid crystal display device 3 to the periphery 13b of the front surface 13u of the liquid crystal section 13 (In this embodiment, only the display area 13a on the front surface 13a is exposed and the periphery 13b of the front surface 13u is covered at the side of the front surface 13u of the liquid crystal section 13). The spacer body 71 is provided along a periphery of the rear surface thereof with a lower positioning wall 73d for positioning the frame section 17 of the liquid crystal display device 3 and along a periphery of the front surface thereof with an upper positioning wall 73u for positioning the touch panel 5.

[0022]

A portion 71a of the spacer body 71 that covers the liquid crystal section 13, as shown in Figures 2 and 3, is provided on a rear surface 71d of the spacer body 71 with a recess, so the portion 71a is spaced away from the liquid crystal section 13 (For example, a corner of a distal end 71b of the rear surface 71d is chamfered in a concave shape). The portion 71a is provided

on the front surface 71u of the spacer body 71 with a recess, so the portion 71a is spaced away from the touch panel 5 (For example, a corner of a distal end 71b of the front surface 71 is chamfered in a flat shape). The lower positioning wall 73d of the spacer body 71, as shown in Figure 2, engages the outer peripheral side surface of the frame section 17 of the liquid crystal display device 3. The frame section 17 is appropriately positioned in the rear surface of the spacer body 71. Thus, the spacer member 7 is positioned appropriately with respect to the front surface of the liquid crystal display device 3, so the spacer member 7 does not extend over the display area 13a. The upper positioning wall 73u of the spacer body 71, as shown in Figure 2, engages the outer peripheral side surface of the touch panel 5. The touch panel 5 is appropriately positioned in the front surface of the spacer body 71. Thus, the spacer member 7 is appropriately positioned with respect to the rear surface of the touch panel 5, so the spacer member 7 does not extend over the action area 5a of the touch panel 5.

[0023]

According to the touch panel apparatus 1 constructed above, the spacer member 7 covers the area from the front surface 17u of the frame section 17 of the liquid crystal display device 3 to a periphery 13b of the front surface 13u of the liquid crystal section 13 while maintaining the clearance between the spacer member 7 and the liquid crystal section 13 (that is, without contacting the spacer member 7 with the liquid crystal section 13). It is possible to suppress lights from the illuminating section 15 from leaking through an outer periphery of the liquid crystal section 13 (for example, a clearance between the frame section 17 and the liquid crystal section 13) to a front side of the liquid crystal section 13, while suppressing the liquid crystal section 13 from causing a failure in display on account of contact between the spacer member 7 and the liquid crystal section 13.

[0024]

Additionally, the portion 71 of the spacer member 7 that covers the liquid crystal section 13 is provided in the rear surface 71d with the recess for defining a clearance between the spacer member 7 and the liquid crystal section 13. It is possible to suitably define a sufficient clearance between the spacer member 7 and the liquid crystal section 13 (In particular, it is possible to suitably define a sufficient clearance between the spacer member 7 and the liquid crystal section 13, even if the front surface 13u of the liquid crystal section 13 projects from the front surface 17u of the frame section 17), thereby appropriately suppressing a contact between the spacer member 7 and the liquid crystal section 13.

[0025]

The portion 71 of the spacer member 7 that covers the liquid crystal section 13 is provided in the front surface 71u with a recess for defining a clearance between the spacer member 7 and the touch panel 5. It is possible to suppress the portion 71 of the spacer member 7 that covers the liquid crystal section 13 from being pushed rearward by the touch panel 5, even if the touch panel 5 is rearwardly flexured by a touch action. Thus, it is possible to suitably define the clearance between the spacer member 7 and the liquid crystal section 13, even if the touch panel 5 is rearwardly flexured.

[0026]

Additionally, the spacer member 7 is formed to expose only the display area 13a on the front surface 13u of the liquid crystal section 13 and to cover the periphery 13b of the front surface 13u. Thus, it is possible to suitably suppress the lights from the illustrating section 15 from leaking through the outer periphery (for example, the clearance between the liquid crystal

section 13 and the frame section 17) of the liquid crystal section 13 to the front side without lowering visibility on the display area 13a on the liquid crystal section 13.

[0027]

Furthermore, the lower positioning wall 73d projects from a rear surface of the spacer member 7 to engage the outer peripheral side surface of the frame section 17 of the liquid crystal display device 3. This can position the frame section 17 with respect to the rear surface of the spacer member 7. Thus, it is possible to dispose the spacer member 7 between the liquid crystal display device 3 and the touch panel 5, so the spacer member 7 is appropriately positioned with respect to the front side of the liquid crystal display device 3.

[0028]

Additionally, the upper positioning wall 73u projects from the front surface of the spacer member 7 to engage an outer peripheral side surface of the touch panel 5. This can position the touch panel 5 with respect to the front surface of the spacer member 7. Therefore, it is possible to dispose the spacer member 7 between the liquid crystal display device 3 and the touch panel 5, so the spacer member 7 is appropriately positioned with respect to the rear side of the touch panel 5.

[0029]

[Effects of the Invention]

According to the invention of Claim 1, the spacer member covers the area from the front surface of the frame section of the liquid crystal display means to a periphery of the front surface of the liquid crystal section while maintaining the clearance between the spacer member and the liquid crystal section (that is, without contacting the spacer member with the liquid crystal section). Thus, it is possible to suppress lights from the illuminating section from leaking

through an outer periphery of the liquid crystal section (for example, the clearance between the frame section of the liquid crystal display means and the liquid crystal section) to a front side of the liquid crystal section, while suppressing the liquid crystal section from causing a failure in display on account of contact between the spacer member and the liquid crystal section.

[0030]

According to the invention of Claim 2, the portion of the spacer member that covers the liquid crystal section is provided in the rear surface with a recess for defining a clearance between the spacer member and the liquid crystal section. Therefore, it is possible to suitably define a sufficient clearance between the spacer member and the liquid crystal section (In particular, it is possible to suitably define a sufficient clearance between the spacer member and the liquid crystal section, even if the front surface of the liquid crystal section projects from the front surface of the frame section), thereby appropriately suppressing a contact between the spacer member and the liquid crystal section.

[0031]

According to the invention of Claim 3, the portion of the spacer member that covers the liquid crystal section is provided in the front surface with a recess for defining a clearance between the spacer member and the touch panel. Thus, it is possible to suppress the portion of the spacer member that covers the liquid crystal section from being pushed rearwardly by the touch panel, even if the touch panel is rearwardly flexured by a touch action. Thus, it is possible to suitably define the clearance between the spacer member and the liquid crystal section, even if the touch panel is rearwardly flexured.

[0032]

According to the invention of Claim 4, the spacer member is formed to expose only the display area on the front surface of the liquid crystal section and to cover a periphery of the front surface. Thus, it is possible to suitably suppress the lights from the illustrating section from leaking through the outer periphery of the liquid crystal section to the front side without lowering visibility on the display area on the liquid crystal section.

[0033]

According to the invention of Claim 5, the lower positioning wall projects from a rear surface of the spacer member to engage the outer peripheral side surface of the frame section of the liquid crystal display means, thereby positioning the frame section with respect to the rear surface of the spacer member. Thus, it is possible to dispose the spacer member between the liquid crystal display means and the touch panel, so the spacer member is positioned with respect to the front side of the liquid crystal display means.

[0034]

According to the invention of Claim 6, the upper positioning wall projects from the front surface of the spacer member to engage an outer peripheral side surface of the touch panel, thereby positioning the touch panel with respect to the front surface of the spacer member. It is possible to dispose the spacer member between the liquid crystal display device and the touch panel, so the spacer member is appropriately positioned with respect to the rear surface of the touch panel.

[Brief Description of the Drawings]

Figure 1 is a general perspective view of embodiments of a touch panel apparatus in accordance with the present invention and also a general perspective view of a conventional touch panel apparatus.

Figure 2 is a cross section taken along line II-II in Figure 1, illustrating the embodiment of the touch panel apparatus in accordance with the present invention.

Figure 3 is an enlarged cross section of a part of an element 7 shown in Figure 2.

Figure 4 is a cross section view taken along line IV-IV in Figure 1, illustrating the conventional touch panel apparatus.

[Explanation of the Symbols]

- 1 Touch panel apparatus
- 3 Liquid crystal display device
- 5 Touch panel
- 5a Action area for a touch panel
- 7 Spacer member
- 13 Liquid crystal section
- 13u Front surface of a liquid crystal section
- 13a Display area of a liquid crystal section
- 13b Periphery of a front surface of a liquid crystal section
- 15 Illuminating section
- 17 Frame section
- 17u Front surface of a frame section
- 71a Portion of a spacer body for covering a liquid crystal section
- 71u Front surface of a portion of a spacer body for covering a liquid crystal section
- 71d Rear surface of a portion of spacer body for covering a liquid crystal section
- 73u, 73d Wall sections

[Document] Abstract

[Abstract]

[Object]

To provide a touch panel apparatus that can suppress a liquid crystal section from causing a failure in display on account of contact between a spacer member and the liquid crystal section and can suppress lights from an illuminating section from leaking through an outer periphery of the liquid crystal section (for example, a clearance between the liquid crystal section of liquid crystal display means and a frame section) to a front side of the liquid crystal section.

[Solving Means]

This touch panel apparatus 1 comprises: a liquid crystal display device 3 including a liquid crystal section 13, an illuminating section 15 disposed at a rear side of the liquid crystal section 13 for illuminating the liquid crystal section 13, and a frame section 17 disposed on an outer periphery of the liquid crystal section 13; a transparent resistive membrane type of touch panel 5 disposed at a front side of the liquid crystal display device 3; and a spacer member 7 disposed between the frame section 17 of the liquid crystal display device 3 and a periphery of the touch panel 5 for defining a clearance between the liquid crystal section 13 of the liquid crystal display device 3 and the touch panel 5. The spacer member 7 covers an area from a front surface 17u of the frame section 17 of the liquid crystal display device 3 to a periphery 13b of a front surface 13u of the liquid crystal section 13 while maintaining the clearance between the liquid crystal section 13 and the liquid crystal display device 3.

[Selected Figure]

Figure 2